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CYPRIS Y FROM THE NORTH PACIFIC
(CRUSTACEA: MAXILLOPODA)^{1,2)}

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Cypris y was first described by Bresciani (1965) as the cypris larva of Hansen's nauplius y ("Larven vom Typus y" reported by Hansen, 1899), based upon a single specimen collected in the Sound, Denmark, and, later, a full description was given by Schram (1970a), who introduced the term "cypris y" into the biology, based upon four specimens from the Bahamas. Although the nauplius y and cypris y are planktonic and the distribution of the nauplius y is very wide, recorded from both sides of the Atlantic Ocean as well as the Mediterranean Sea (see Schram, 1972, for a recent revision), their systematic position within the Maxillopoda is not yet settled (Hessler, 1982, and other authors) because their adults are still unknown. In the present paper, we describe a specimen of cypris y from the North Pacific, which has recently been collected together with some specimens of nauplius y. Our nauplius y from the North Pacific will be described elsewhere.

A specimen of cypris y collected in Tanabe Bay (33°42'N, 135°21'E) off the Seto Marine Biological Laboratory on the Pacific coast of the Middle Honshu, the main island of Japan, was examined. The specimen was found in a night plankton sample hauled with a net (mesh number NXX 13 of the Japanese standard, 94 μ m opening) designed to collect plankton within a surface layer above a depth of 15 cm (30-IX-1983, Ohtsuka leg.). The specimen dissected was mounted onto slide glasses with Gum-chloral medium, and was examined with the phase contrast microscope.

Since the preparation of the first antennae was not good, the description of the first antenna is based mainly on the observation before dissection, and some of its characteristics might be overlooked or misconceived.

Cypris Y

B o d y (Figs. 1-A, 2-A, B) 0.46 mm long, colorless, transparent, consisting of 10 separate somites: i.e., cephalothorax (cephalon plus a, presumably fused or undifferentiated, thoracic somite with the first pair of legs), five free thoracic somites which are pedigerous, and four abdominal somites, of which the last bears a pair of caudal

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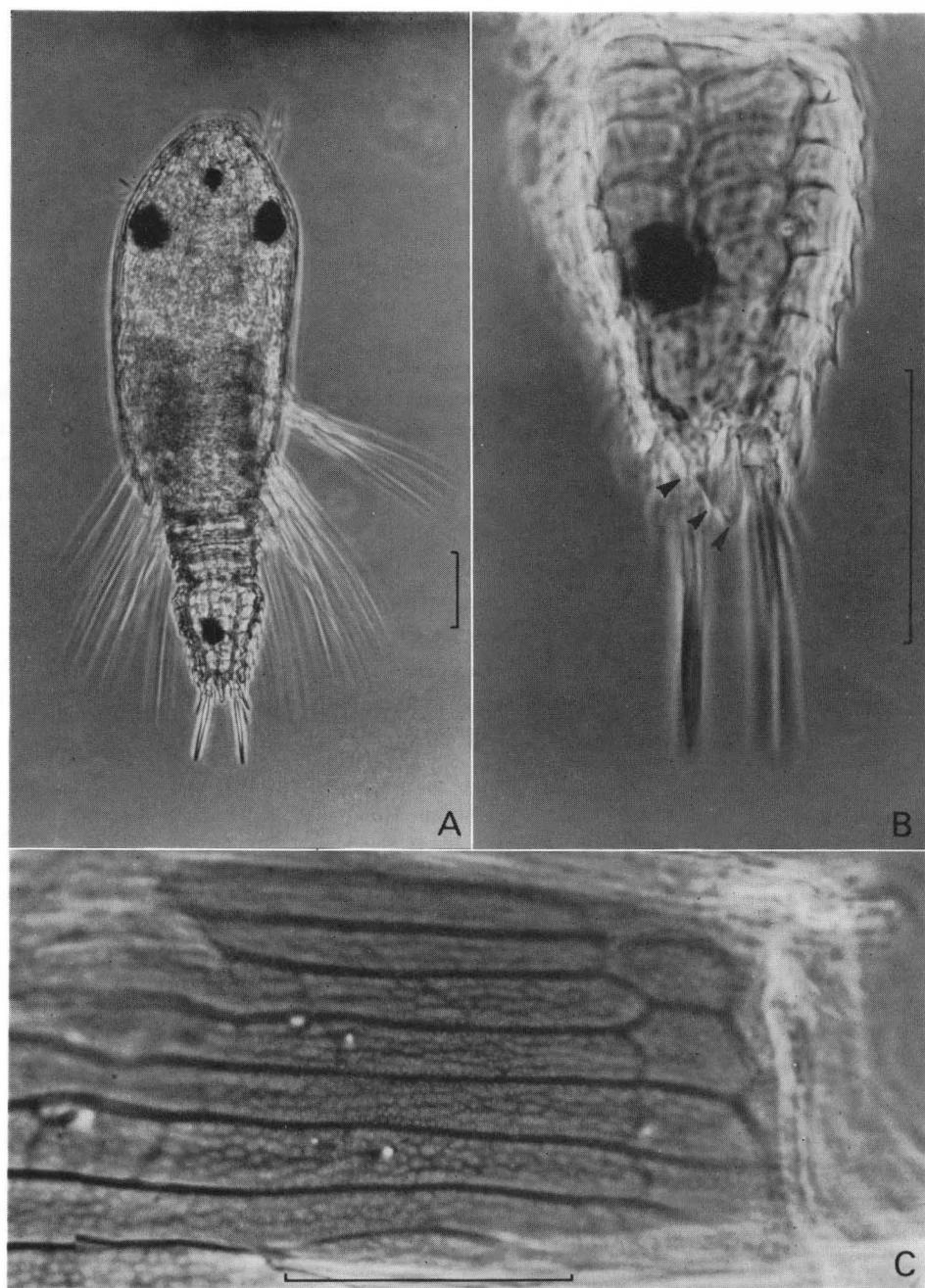


Fig. 1. Cypris y. A. Habitus, dorsal; B. Fourth abdominal somite (three peaks of 'brade-shaped projection' indicated by arrowheads); C. Carapace. Scale bar 50 micra.

rami. Cephalothorax tapering anteriorly, with a nauplius eye and a pair of compound eyes, which are tinctured with very dark brown; carapace (dorsal shield of the cephalothorax) extending over succeeding three thoracic somites, laterally reaching the fifth thoracic somite, with many chitinous stripes, which are mainly stretched longitudinally, and mesh-like texture filled with numerous punctures (not illustrated in Fig. 2: see Figs. 1-C, 3-B). Fifth and sixth thoracic somites each ornamented with a thin tergite. First three abdominal somites (Fig. 3-G) each with a well-developed tergite which is much sclerotized and with some chitinous ridges. Fourth (the last) abdominal somite ("furca" in the sense of Bresciani, 1965, and Schram, 1970a) longer than preceding three somites combined, tapering posteriorly, with chitinous ridges which seemingly form frames of roughly rectangular plates dorsally and laterally (Fig. 3-D, E, F, G); each angle of these frames forming a spinular projection; areas encircled with frames made of mesh-like texture (see Fig. 3-D); ventral face forming at least six steps with serrate edges (Fig. 3-E); a pair of horny processes arising from ventral end between caudal rami; the center of posterior end forming a blade-shaped projection which is stretched dorsoventrally and with three peaks along its free edge (Figs. 1-B, 3-F). Caudal ramus consisting of one small segment, as long as wide, armed terminally with two spatulate setae and two spines.

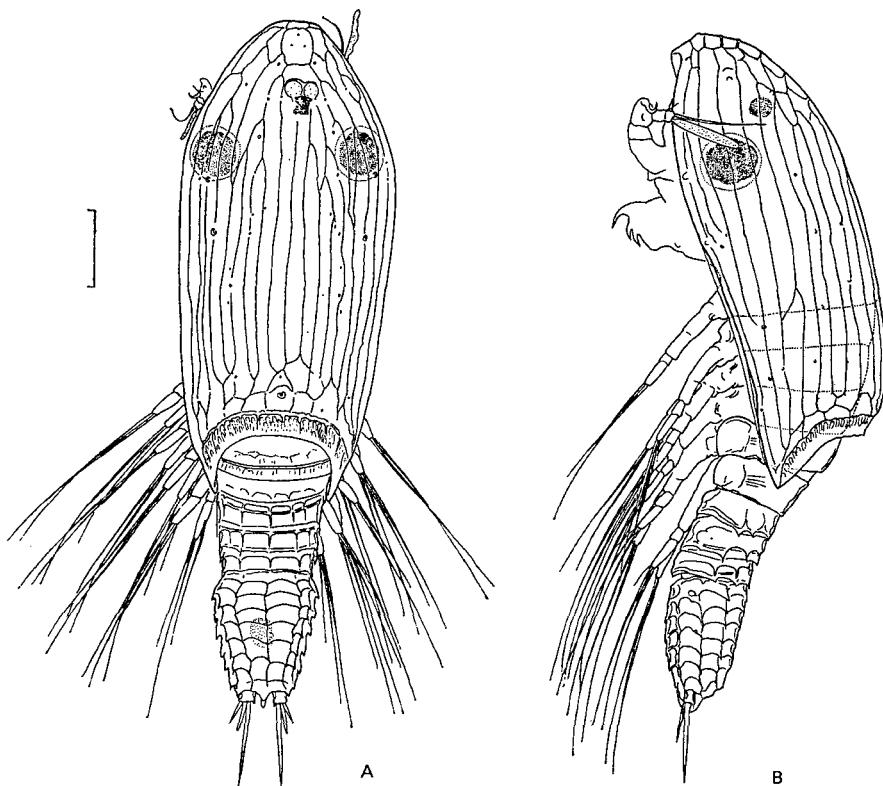


Fig. 2. Cypris y. A. Habitus, dorsal; B. Habitus, lateral. Scale bar 50 micra.

First antenna (Fig. 3-A) arising from ventral face of cephalothorax just anterior to oral pyramid, consisting of at least, four segments; first segment long, armed with no seta; second segment swelling, armed with an arched claw apically; third segment small, with a fine seta on inner distal edge; fourth segment small, armed apically with an aesthetasc and a seta.

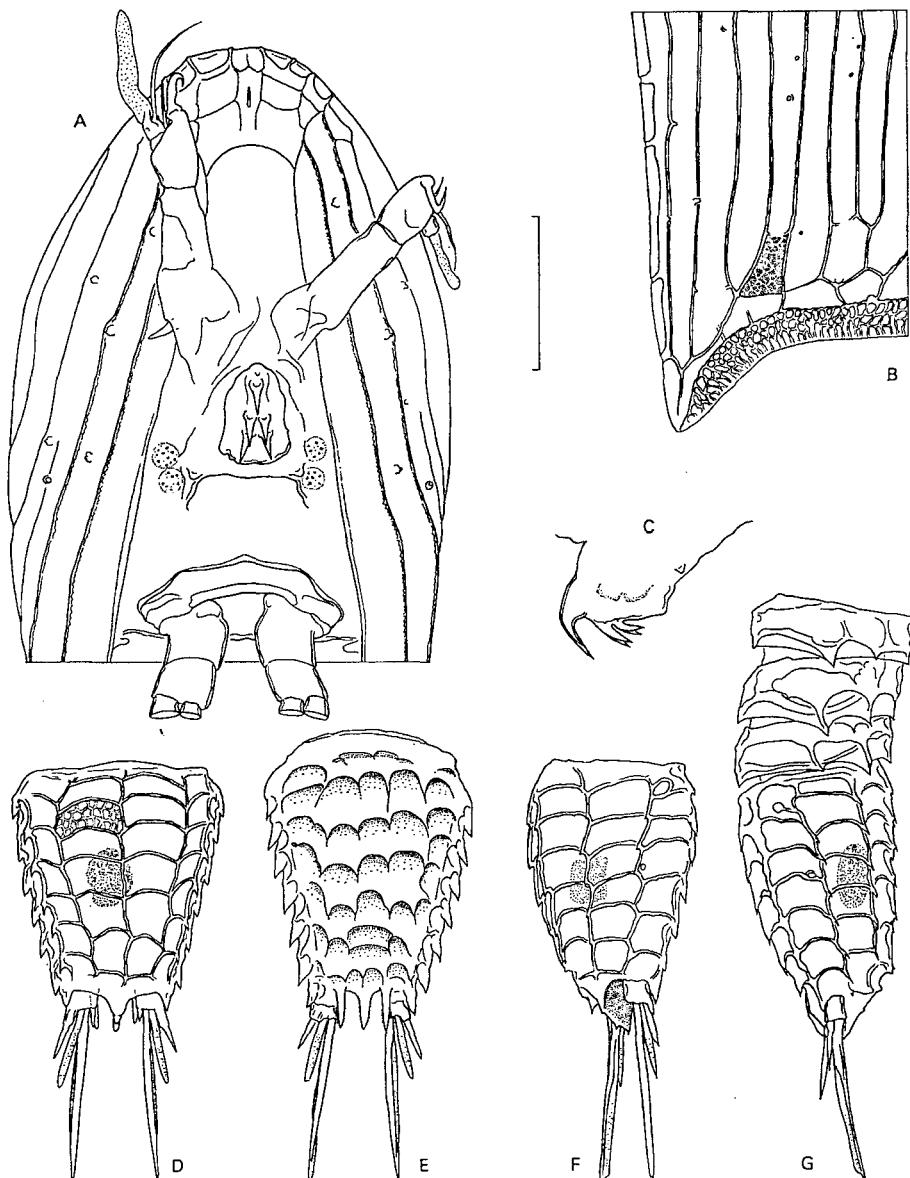


Fig. 3. Cypris y. A. Cephalothorax, ventral; B. Carapace (most punctures are omitted); C. Oral pyramid; D. Fourth abdominal somite, dorsal (mesh-like texture on a 'plate' is shown); E. Fourth abdominal somite, ventral; F. Fourth abdominal somite, dorsolateral; G. Abdomen, lateral. Scale bar 50 micra.

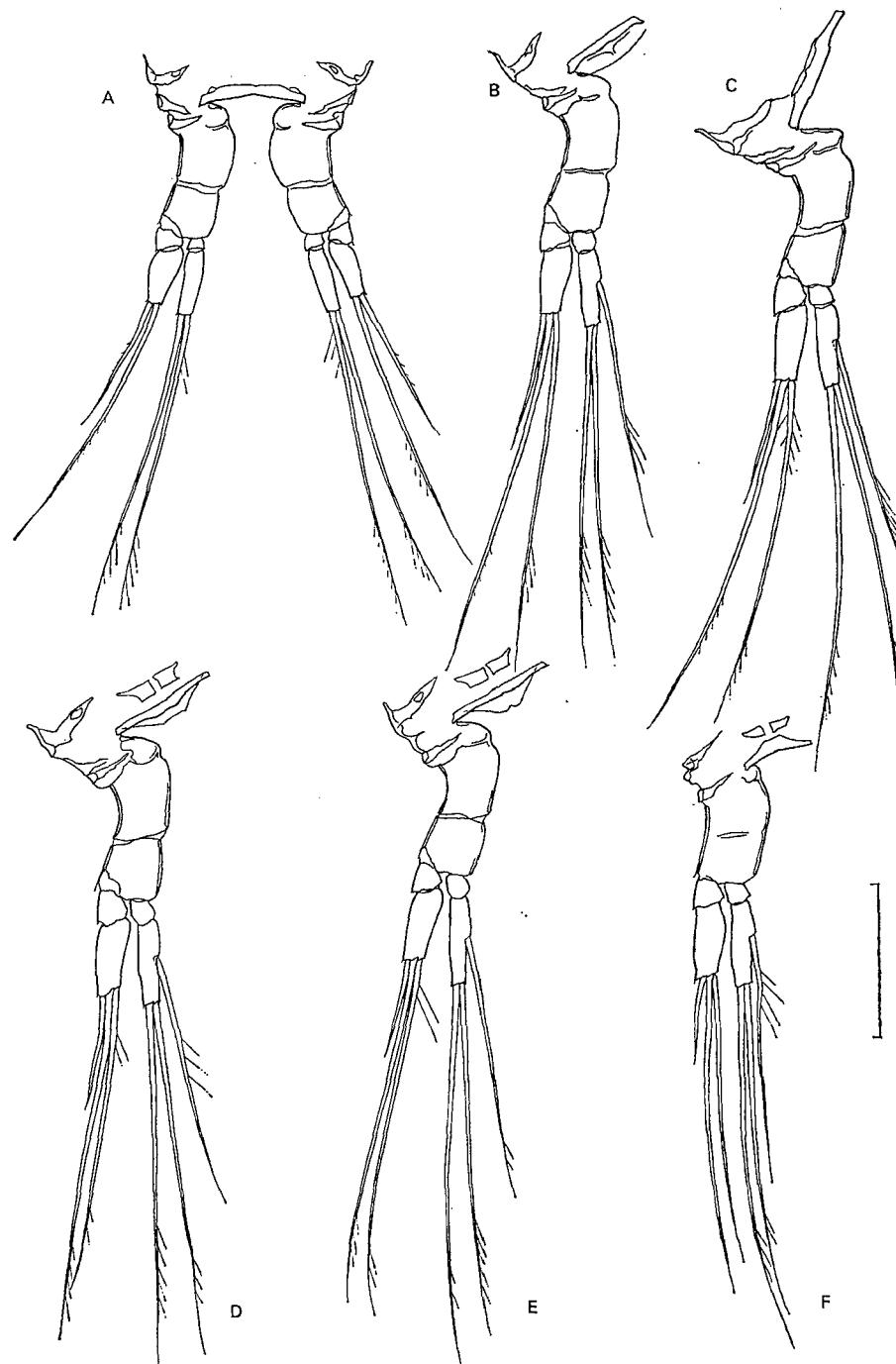


Fig. 4. *Cypris y.* A. A pair of leg 1; B. Leg 2; C. Leg 3; D. Leg 4; E. Leg 5; F. Leg 6.
Scale bar 50 micra.

O r a l p y r a m i d (Figs. 2-B, 3-A, 3-C) armed with five claws (a single anterior claw and two pairs of posterior claws) on its apical edge, and a pair of tubercles, which are widely spaced, near its posterior base. A few large cells filled with granular bodies occurring near the tubercles.

L e g 1 (Fig. 4-A). A chitinous wide plate inserted between both legs. Coxa and basis clearly defined from each other, armed with no spine or seta. Each ramus consisting of two segments, of which the first is very short and without any seta or spine. Second exopodite segment somewhat swelling proximally, armed with two apical setae, of which the outer is shorter than the rest. Second endopodite segment subcylindrical, armed with two apical setae which are subequal in length. **L e g 2** (Fig. 4-B), **l e g 3** (Fig. 4-C), **leg 4** (Fig. 4-D), and **l e g 5** (Fig. 4-E). Second exopodite segment armed with three apical setae, of which the outermost is shorter than others. Second endopodite segment armed with two apical setae and one inner seta, which arises from the middle of inner edge. Other structures as in leg 1. **L e g 6** (Fig. 4-F). Chitinous plate between both legs narrower than the counterpart of preceding legs. Coxa and basis not clearly defined from each other. Other structures as in leg 2, leg 3, leg 4, and leg 5.

Discussion

In the present paper, we call the first somite "cephalothorax" since it is composed of the cephalon fused with a pedigerous thoracic somite. The same cephalothorax is found also for the cypris y illustrated by Schram (1970a, Fig. 1) based upon a specimen from the Bahamas. The cypris y reported from the Sound, however, has the cephalon clearly separable from the first pedigerous somite (see Bresciani, 1965, Fig. 2 and Pl. XL).

The present specimen proves the carapace of cypris y is not bivalvate, and strongly supports Schram's view that cypris y differs from any cirriped cypris and ascothoracid larvae, whose carapace is bivalvate (Schram, 1970a, p. 21; see Grygier, 1983, for a comprehensive revision of ascothoracid development).

The blade-shaped projection arising from the central end of the last abdominal somite probably accords with both the "median process of moderate size" and the "almost quadratic plate situated more ventrally than the dorsal plate" described by Schram (1970a). When it is seen from the dorsal, the peaks along its free edge would appear as if they were separate projections or plates (cf. Figs. 1-B, 3-D, 3-F).

Although the present specimen has a, presumably fecal, pellet in its last abdominal somite (Fig. 3-D, F, G), no gut could be found inside the somite. An anus could not be found either. Absence of the anus is probable since it is known that the nauplius y has no anus (Eloffson, 1971). The 'fecal' pellet might be a remnant of yolk.

The chitinous plate inserted between each pair of legs is a prominent accessory for the legs of cypris y. This plate is equivalent to the intercoxal plate (see Itô,

1983, p. 155) or intercoxal sclerite (see Boxshall and Lincoln, 1983, p. 12) of copepod legs. Legs of all of the known cypris y including the present specimen, however, are biramous, and have neither pseudopodite or basal outer seta, which is a principal element of copepod legs, nor any endite (cf. Itō, 1982; Boxshall and Lincoln, 1983).

In the present specimen, each endopodite of the last five pairs of legs is composed of two segments. According to Schram (1970a), the counterparts of his material from the Bahamas are composed of two segments in the two specimens labelled Nos. 1 and 4 and three segments in the rest. The single specimen from the Sound shown by Bresciani (1965, Fig. 2) has three-segmented endopodites (Bresciani's description on the segmentation of the legs is incorrect: See Schram, 1970a, p. 18). There is no doubt that two separate 'forms' different in the endopodite segmentation of their legs are present within the cypris y of the world. There would be three possible explanations for the presence of these 'forms': These two 'forms' represent 1) variation of the same developmental stage, 2) successive developmental stages, or 3) separate species. As already pointed out by Schram (1970a, p. 20; 1970b, p. 64; 1972, p. 23), the presence of some separate species can be expected through the previous studies of nauplius y from various localities. These 'forms' of cypris y might represent separate species, though it is still premature to be concluded.

Although the systematic position of the nauplius y and cypris y has long been discussed in relation with the Cirripedia and Ascothoracida (Hansen, 1899; Bresciani, 1965; Schram, 1970a; Elofsson, 1971), this question is not yet fully answered. At the present, as suggested by Hessler (1980, p. 165), the Maxillopoda would be accepted as a taxon that accommodates this crustacean with the nauplius y and cypris y larvae, though the validity of the Maxillipoda itself is a matter of argument (see Boxshall, 1983). The development of this crustacean has many important characteristics, and detailed studies of this crustacean will throw light on the phylogeny of the Maxillopoda, including the Tantulocarida recently erected by Boxshall and Lincoln (1983). Phylogenetical implication of Hansen's nauplius y and cypris y will be discussed also in a forthcoming paper (Itō, in preparation) which will focus on the relation between the Tantulocarida and the Maxillopoda.

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